

## **Oil Painting High Resolution Photography by J.Mamoun**

### **How to Make a Super High-Resolution Digital Photo of an Oil Painting or Artwork**

To make a super-high resolution digital photo, one can make dozens of macro photos of the artwork using a cell phone, and then stitch the photos together digitally using a digital photo stitching program, like Microsoft Image Composite Editor. A cheap cell phone like a used Samsung A71 could be used here. Unfortunately, a computerized photo stitching program is easily confused. It needs to detect logical connections of line, color and size between the numerous macro shots, to figure out how to stitch them together. For this reason, if the photos differ even by a microscopic amount in how each photo shows the size or focus of the same object, then the stitching program will become confused. The program will then delete some macro photos because it does not know how to fit them with the other photos, or distort the perspective of the final photo.

A macro photo is a highly magnified photo. The camera is put on macro mode, and the camera focuses on a small patch of the painting, at a distance of 2-5 centimeters, depending on where the macro photo distance is. At this distance, microscopic textures in the painting become visible. Since the painting is being photographed with micro-scale resolution, the slightest bit of shakiness will blur the photo. The photographer's hand may shake with microscopic vibration, and the photographer's heartbeat may shake the camera enough to slightly blur the microscopic details in the photo. If macro shots show different levels of focus or blurriness, due to microscopic shaking of the camera while making the shots, the different focuses will confuse the photo stitching program, and make it difficult for the program to know how to stitch the photos.

How can this shaking problem be solved? First, the digital camera must be mounted on a tripod, so that the camera is absolutely still. Second, the photographer must not press a button or screen area on the camera to take the photo, since this will shake the camera. Instead, the photographer should choose an option in the camera's settings that allows the photograph to use a voice command to activate the photo shutter, to take the photo without touching the camera. Also, the floor on which the tripod is resting may vibrate slightly, such as to shake the camera. This problem can be solved by putting several very heavy and wide books under the tripod, so that the books dampen any vibration from the floor.

Another problem is lighting. If the photograph moves the camera along the painting, the lighting can be different at each surface patch of the painting. This is because the room light that is lighting the painting shines more light on the painting the closer the part of the painting is to the light, and shines less light on the painting for parts of the painting are farther away from the light source. The larger the painting, the more the difference in illumination between parts of the painting that are farther from the light source, versus parts that are closer to the light source. Different amounts

of light hitting the painting affect the shade and brightness of the colors as they appear in the macro shots. These differences in shade and brightness can confuse the digital stitching software, so that the program does not know exactly how to align the photos like a jigsaw puzzle. If the photographer moves the camera along the surface of the painting to make the macro shots, then at each surface point along the painting's surface, the lighting at that painting surface point will be different due to the fact that each patch is of a different distance from the light source compared to other patches.

How can this problem of different lighting quantities hitting different patches of the painting be solved? The solution is to keep the location of the camera fixed in place using a tripod, and then to photograph the painting by moving the painting along the wall, underneath the camera, so that each patch of the painting is photographed at the same exact same location along the wall where the camera lens is focused, and where the camera lens is fixed in position by the tripod. The photographer moves the painting under the camera lens, instead of moving the camera along the painting surface. The wall braces the painting and keeps the painting steady and focused. This will result in each macro shot being done under the exact same lighting conditions, so that the painting colors are represented under the same lighting conditions. The proportions of the colors of the original oil painting will be properly represented in the digital photo of the painting, and the photo stitching program will be less confused trying to put together photos when they are all proportionately along the same basic "color space." Note: if the photographer is photographing an artwork on paper, such as a lithograph or watercolor, the paper must be strictly flat against the wall when being photographed. If the paper is slightly curved, elevated, or non-flat against the wall surface, that may create enough microscopic surface curvature to cause one macro photo shot to be made at a different angle or photo distance from the other other macro shots. A single non-homogeneous macro shot may be enough to cause big distortion in the final composite photo made by the composite editor program.

A few other points about lighting. The photographer should not photograph using flash photography, since the flash will distort the natural coloration of the painting. Instead, the photographer should only photograph without flash, and use the lighting of the room to bring out the painting's colors. A non-fluorescent lighting source, such as a bright LED spot light, is perhaps best for illumination the painting. If the light is too bright, this may result in whitewashing of the painting. If the painting is varnished, parts of the painting may be shiny in the macro shot. Such shine can blur out or distort the painting's details. The photographer should experiment with positioning of the painting and lighting, to find camera distances and angles where such varnish shine does not appear in the macro shots. Also, the painting should ideally be illuminated by only one light source. Having two or more light sources can result in subtle shadowing of the painting, that can distort colors and image dimensions. The way to check for light shadowing is for the photographer to put a fingertip on the wall next to the painting, to see if the photographer's finger

seems to cast multiple shadows due to multiple light source. The photographer then turns off light sources until the finger no longer casts more than one shadow on the wall. In addition, if the lighting is behind the camera, the camera can cast shadows on the painting, so that some macro shots may show dark spots from the shadows. This will majorly confuse the photo stitching program. The way to prevent this shadowing effect is to position the light so that the room light is in front of the camera, but also almost vertically above the painting. When the light is almost vertically above the painting, the camera will probably not cast a shadow on the painting, even if the camera's focus is only 2-5 centimeters away from the painting.

Another problem with making multiple macro shots of a painting is that if any shot differs from another in the angle at which the shot was made, or in the distance at which the shot was made, then the sizes of the same object will appear differently for each macro photo made of that object among the different macro shots of that object. Even if these differences in photographing angle or distance are microscopic, that will be enough to confuse the photo stitching program. The program will be very confused trying to figure out how the same object, line, shape, painting patch, etc., shown in different macro shots is different in size with each macro shot.

How can this problem of different angles and photographing distances be solved? The answer is by not using the hands to try to position the camera to take macro shots, since the hands cannot angle the camera at same angles and distances with microscopic precision. Instead, the camera is mounted on a tripod to fix the camera's angle and distance from the photograph focal point. The painting is then moved along a wall, and is held flat against the wall and braced by the wall at a fixed angle and distance from the camera, to position each patch of the painting for a macro shot. The camera shutter is activated by voice commands and not by touching a button on the camera, to prevent the camera from vibrating or moving during the shutter movements. This vibration will microscopically alter the photographing angles and distances of different macro shots.

Another problem is that the lens of the camera may distort image dimensions along the periphery of the macro photo, due to the curvature of the camera's fish-eye lens. One way to solve this problem is to use photographing options that do not use the entire lens, but photograph an image taken at the most central part of the lens. There are options that only photograph something using part of the lens, creating a photo that does not fill up the entire screen of the cell phone. The photographer should not digitally crop photos to digitally remove the outside border of the photo. The cropping program may then distort the cropped photo, by enlarging its surface to fit the computer screen, which may distort the dimensions of the same objects photographed in that photo and other macro photos.

It is best to photograph the entire painting in one session, since this will guarantee that every macro shot is taken with exactly homogeneous camera angles, focal distances, lighting intensity and color

proportionality. If the photo stitching program fails to stitch these images together perfectly, or shows patches of black where the photographer accidentally missed photographing a specific surface patch of the painting, it is best to start over and completely retake another set of macro photos. If the photographer tries to add other macro photos to the initial set to try to improve the stitching process or to fill in voids, it may not be guaranteed that the added photos will be of exactly the same photographing angles, distances and lighting as the original set. Even a microscopic discrepancy here can confuse the photo stitching program.

If the photographer creates a set of macro shots of the oil painting that are all made with the exact same photo angles, photo distances and lighting conditions, without even microscopic amounts of blurriness, the stitching program should be able to stitch together an ultra-high resolution photo of the oil painting, that shows microscopic textures within the oil painting, and shows the painting's colors in proportion. This will result in a digital photo of the oil painting that captures such precise details in the painting that the photo of the painting can be almost as vivid and esthetically entrancing as the original painting was viewed with the eye.

The macro photo is then saved as a JPEG at the highest resolution in the Microsoft Image Composite Editor program. The photo may need to be touched up and edited in GIMP, and open-source photoshop-like graphics editing program. The GIMP program may be used to slightly rotate the composite image so that it appears straight. In addition, if there are some areas in the background (that are not part of the main esthetic qualities of the painting) that need to be patched up, the background texture can be copied and pasted to patch up these areas to give the painting photo a reasonable semblance of completeness and graphical coherence. The edited photo is then saved as a JPEG at the highest resolution.

Also, the photographer should take the painting out of the frame when photographing. This is because if the painting is photographed in its frame, the camera may photograph parts of the frame along with the painting in the same macro shot. This can be a problem since the frame will be located in front of the painting surface. The camera may then decide between focusing on the frame, or focusing on the painting. If the camera focuses on the frame, then part of the painting may be slightly blurred in the macro shot, so that this part of the painting will have a different focus or focal distance compared to other macro shots of the painting. This could confuse the photo stitching program. Also, the frame may cast shadows on part of the painting, which will also lead to inaccurate results when the photo stitching program stitches the macro shots.